Table 9. Effect of soil and air temperature on leaf number of *Philodendron scandens oxycardium* single eye cuttings.

Min air temp	45°	70° min soil temp 50°	55°	60°
Date				
23 Jan		no new leaves		
20 Feb		no new leaves		
27 Mar	1.4 (.64)[z]	1.2 (.4)	0.6 (.66)	0.9 (.54)
3 Apr	1.6 (.49)	1.5 (.5)	0.8 (.4)	1.9 (.83)
Min air temp	**45°**	**Variable soil temp 50°**	**55°**	**60°**
23 Jan		no new leaves		
20 Feb		no new leaves		
27 Mar		no new leaves		
3 Apr	0.2 (.4)	0.4 (.49)	0.3 (.46)	0.6 (.49)
24 Apr	1.2 (.37)	1.7 (.27)	1.6 (.44)	2.0 (.35)

[z]Numbers in parenthesis are standard deviations.

Results of these experiments indicate high quality foliage plants can be produced at reduced air temperatures if soil heating is provided. Warm water soil heating to 70°F minimum reduced winter production time for rooted *Dieffenbachia* and *Aglaonema* tips by 45% and for *Epipremnum* and *Philodendron* suitable for 3 inch pots by 35% and 25%, respectively, at the minimum air temperatures tested. Data showed that even cold sensitive crops such as *Epipremnum* and *Aglaonema* respond to soil heating without evident chilling damage despite being subjected to air temperatures known to inflict damage. Based on these results, growers who wish to maximize fuel efficiency and increase winter production of tropical foliage might experiment with 50°F minimum air temperature and 70 to 75°F minimum soil temperatures.

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DOLOMITE AND FLUORIDE AFFECT FOLIAR NECROSIS OF CHAMAEDOREA SEIFRIZII AND CHRYSALIDOCARPUS LUTESCENS[1]

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Additional index words. tipburn, superphosphate, palm.

Abstract. **Experiment 1, a 5 x 3 factorial, was conducted with 5 fluoride (F) variables, 0, 68, or 136 mg F from 20% single superphosphate or 34 or 68 mg F from NaF/15 cm pot, and 3 dolomite levels, 0, 3, or 6 kg/m³. Three 2-3 leaf seedlings of** Chamaedorea seifrizii **Burret. or** Chrysalidocarpus lutescens **H. Wendl./15 cm pot was used as an experimental unit. Foliar necrosis and leaf F content were evaluated 5 months after experiment initiation. Plants in media containing superphosphate had the most necrosis but additions of NaF to the medium did not produce necrosis. Plants in media containing dolomite had the least necrosis and tissue F. Additions of superphosphate and NaF had little effect on soil pH or electrical conductivity. Dolomite increased pH, but did not alter electrical conductivity. Experiment 2 was conducted with 2 F sources, 20% SP and NaF, at 34 mg F/15 cm pot, and 0 or 4 kg dolomite/m³. Pots were filled with same medium as in Experiment 1 and no plants were utilized. Medium was leached every 1, 5, 8, and 11 days. Leachate was analyzed for F content. Dolomite greatly decreased soluble F.**

Chamaedorea seifrizii (reed palm) and *Chrysalidocarpus lutescens* (areca palm) are two of the more popular palms used for interiorscaping. Palms are produced from seed and are salable as soon as the first true leaf appears; however, palms used for interiorscaping are much larger.

Foliar tipburn and necrosis is a major production problem with these palms. Fluoride induced damage has been reported on parlor palm (*Chamaedorea elegans* Mart.) (2), and tip necrosis of areca palm has been attributed to high soluble salts levels (4). After the tips become necrotic, necrosis sometimes enlarges and entire leaflets of the areca and seifrizii palms collapse. Necrotic spotting in lower areas of the leaflets is often associated with the tipburn. Since research (2) indicated foliar necrosis and tipburn of parlor palm was related to the amount of fluoride (F) found in foliar tissue, an experiment was conducted to determine if dolomite and F in 20% superphosphate (20% SP) or sodium fluoride (NaF) influenced foliar necrosis of areca and seifrizii palm.

Materials and Methods

Experiment 1

A 5 x 3 factorial experiment in a randomized block design included 5 F variables, 0, 68, or 136 mg F from 20% SP incorporated/15 cm pot (about 0, 3, or 6 kg 20% SP/m³) or 34 or 68 mg F from NaF/15 cm pot (F equivalent to 1.5 or 3 kg 20% SP/m³), and 3 dolomite levels, 0, 3, or 6 kg/m³. The experiment was initiated July 16, 1980, with 2-3 leaf seedlings in a medium of peat:builder's sand (3:1 by volume) containing 1 kg Perk/m³. Three seedlings/15 cm diameter pot was the experimental unit for each species. There were 4 replications with reed palm and 8 with areca. Plants were placed in a glass greenhouse shaded to receive

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approximately 215 $\mu Em^{-2}s^{-1}$ maximum natural illumination with a minimum of 20°C and a maximum of 40°. Palms were irrigated twice weekly and fertilized weekly with 200 mg N/liter from liquid 9N-2P-5K. Foliar necrosis was evaluated December 1, 1980, with a rating scale of 1 = severe necrosis, 3 = moderate necrosis or tipburn, and 5 = no necrosis. Entire leaflets were then sampled for F content. To determine F content, a 0.5 g tissue sample was macerated in 15 ml 1N HNO_3 at room temperature for 2 hours. After filtration and washing with three 15 ml portions of double distilled water, pH was adjusted to 5.5 with solid $NaHCO_3$ and diluted to 40 ml (6). Solutions were diluted 1:1 with total ionic strength adjustment buffer (TISAB) and concentration was measured with an Orion 404 Specific Ion Meter and a 96-09 electrode. Medium pH and soluble salts (2 water/1 soil, v/v) also were determined.

Experiment 2

To determine effect of dolomite on F solubility, a test was established with pots containing only medium. Seventy-five mg of NaF (34 mg F) or 2.25 g 20% SP (34 mg F) (both F sources equivalent to 1.5 kg 20% SP/m³) was mixed in 15 cm pots containing a medium of 3 parts Florida sedge peat and 1 part builder's sand (v/v) with no amendment or amended with 4 kg dolomite/m³. Pots were then leached with 300 ml deionized water every 1, 5, 11, and 18 days. Leachate was collected for approximately 10 minutes and adjusted to pH 5.0-6.0 with sodium bicarbonate. Twenty ml was added to 20 ml TISAB and F determined with the Orion Meter.

Results and Discussion

Experiment 1

F source. Additions of NaF to the medium had no effects on necrosis of either palm but 20% SP did cause an increase in necrosis (Table 1). Tissue F of areca palm was not affected by F source, but the high level of 20% SP caused a high level of tissue F in reed palm (Table 2). There was no difference in medium pH due to F source and only slight difference in electrical conductivity because of F source. Earlier research (2) showed there was no difference in foliar necrosis grade of parlor palm because of F source when dolomite was not added to the medium, but 20% SP caused more necrosis than NaF when dolomite had been added to the medium. No interactions were significant in this experiment.

Soluble salts. Soluble salts could contribute to tip

Table 1. Influence of dolomite and fluoride levels on foliar necrosis and tissue fluoride of areca palm and on medium pH and soluble salts. Expt. 1.

Treatments		Foliar necrosis[y]	Tissue F (ppm)	Medium	
				pH	Soluble salts (micromhos/cm)
F source[z]	F level (mg F/15 cm pot)				
Control	0	2.9 c[x]	16 a	4.0 a	379 ab
20% SP	68	1.9 b	20 a	4.4 a	318 a
20% SP	136	1.1 a	21 a	4.6 a	444 b
NaF	34	2.9 c	16 a	4.2 a	334 a
NaF	68	2.7 c	18 a	4.4 a	358 a
Dolomite level (kg/m³)					
0		1.7 a	22 b	3.9 a	373 a
3		2.0 b	15 a	4.5 b	371 a
6		3.1 c	16 a	5.3 b	357 a

[z]20% SP = 20% superphosphate; NaF = sodium fluoride.
[y]1 = severe necrosis, 3 = moderate necrosis or tipburn, and 5 = no necrosis.
[x]Mean separation within columns within treatment groups by Duncan's multiple range test, 5% level.

Table 2. Influence of dolomite and fluoride levels on foliar necrosis and tissue fluoride of reed palm and on medium pH and soluble salts. Expt. 1.

Treatments		Foliar necrosis[y]	Tissue F (ppm)	Medium	
				pH	Soluble salts (micromhos/cm)
F source[z]	F level (mg F/15 cm pot)				
Control	0	2.9 c[x]	25 a	5.5 a	623 a
20% SP	68	1.9 b	26 a	5.5 a	864 a
20% SP	136	1.3 a	67 b	5.8 a	786 a
NaF	34	2.6 c	26 a	5.4 a	799 a
NaF	68	2.7 c	27 a	5.7 a	664 a
Dolomite level (kg/m³)					
0		1.7 a	57 b	5.5 a	540 a
3		2.2 b	24 a	5.4 a	772 a
6		2.9 c	22 a	6.1 a	750 a

[z]20% SP = 20% superphosphate; NaF = sodium fluoride.
[y]1 = severe necrosis, 3 = moderate necrosis or tipburn, and 5 = no necrosis.
[x]Mean separation within columns within treatment groups by Duncan's multiple range test, 5% level.

necrosis, but the small variation in salts (Tables 1 & 2) indicates this could not be the only factor. Other research (1, 2, 3) has also shown that soluble salts were not significantly related to F induced foliar necrosis.

Dolomite. Tipburn was closely related to dolomite levels ($r = -0.947$ and -0.828 respectively, $P > 0.05$, Tables 1 & 2). As dolomite levels in soil increased, tip necrosis and tissue F decreased. Other research (2) has shown this relationship between dolomite and tip necrosis caused by F.

Experiment 2

Dolomite greatly reduced leached F (Table 3) and more F was leached from pots containing 20% SP than NaF. Sheldrake *et al.* (5) also reported reduced soluble F in a medium of 1 peat and 1 perlite (v/v) containing dolomite. A medium with 6 kg dolomite/m^3 had approximately 1/6 the soluble F of media with no dolomite.

Table 3. Soluble fluoride (ppm) reduction by dolomite, Experiment 2.

Dolomite (kg/m^3)	Fluoride source[z]	Leachate collection dates			
		7/24	7/28	8/4	8/11
4	20% SP	1.2 a[y]	1.1 a	0.8 a	0.8 a
4	NaF	0.5 a	0.8 a	0.6 a	0.4 a
0	20% SP	11.5 c	11.5 b	11.5 b	11.5 c
0	NaF	2.7 b	8.6 b	8.6 b	6.5 b

[z]20% SP = 20% superphosphate; NaF = sodium fluoride. Fluoride was equivalent to 1.5 kg 20% SP/m^3 (1.5% F).
[y]Mean separation within columns by Duncan's multiple range test, 5% level.

These data and previous research (2) indicate palms are F sensitive. Fluoride containing substances should not be used during palm production and pH should be maintained near 6.0. Palms are sensitive to high soluble salts (4), but lower leaves are usually light green to necrotic in contrast to upper leaves with necrotic streaks and tipburn caused by excess F in the tissue.

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LIGHT AND FERTILIZER LEVELS AND SLOW-RELEASE FERTILIZER SOURCES INFLUENCE GROWTH OF BRASSAIA ACTINOPHYLLA ENDL.[1]

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Additional index words. foliage plant, schefflera, urea formaldehyde, shade.

Abstract. **Urea formaldehyde fertilizer sources were not as efficient as a resin coated source (Osmocote) in producing high quality** Brassaia actinophylla. **Although increasing fertilizer level and amount of shade generally increased plant quality, there was an interaction between fertilizer sources and shade levels which indicated the greater efficiency of Osmocote at every shade level. Availability of nitrogen is discussed in relation to levels found in tissue of plants grown with equivalent N rates, but from different sources. Nitrogen from resin coated fertilizer was higher in tissue than from equivalent rates of urea formaldehyde.**

Slow-release fertilizers have gained in popularity with tropical foliage plant producers. Although slow-release fertilizers cost more than liquid or granulated forms, they offer application advantages for producers of container-grown crops. When proper amounts are applied, slow-release fertilizers have been reported (6) to supply adequate nutrition for 3 to 12 months. Slow-release fertilizers can be incorporated into the potting medium prior to planting, eliminating further fertilizer applications for short-term crops, or surface applied, so no expensive application equipment is needed. Thus, reductions in labor and equipment help offset higher fertilizer cost.

Research conducted at the Agricultural Research Center, Apopka (1, 3, 4, 5, 10) has shown good quality tropical foliage plants can be grown using Osmocote, a resin coated fertilizer. In a preliminary experiment (unpublished), *Brassaia actinophylla* (schefflera) were grown for 6 months under liquid and Osmocote slow-release fertilizer and good quality plants were produced on both programs. Rosenbaum *et al.* (11) reported potted *Chrysanthemum morifolium* Ramat. 'Puritan' were of good quality when grown with either a liquid or slow-release resin coated fertilizer for one season and were superior to chrysanthemums grown with methylene urea (same as urea formaldehyde). Tjia *et al.* (12) found urea formaldehyde fertilizers released nutrients too slowly for optimum growth of potted chrysanthemums.

Previous work (1, 2, 7) with tropical foliage plants has shown light levels in the production range influence growth characteristics and, probably, the amount of fertilizer necessary to produce quality foliage plants (1, 5). Suggested light and nutritional levels for production of schefflera are 50 to 60 klx (about 63% shade from polypropylene shade cloth) with about 2000 kg N/ha per year (equivalent to 5 kg N/100 m^2/3 months), based on a 3-1-2 ratio fertilizer source (5).

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